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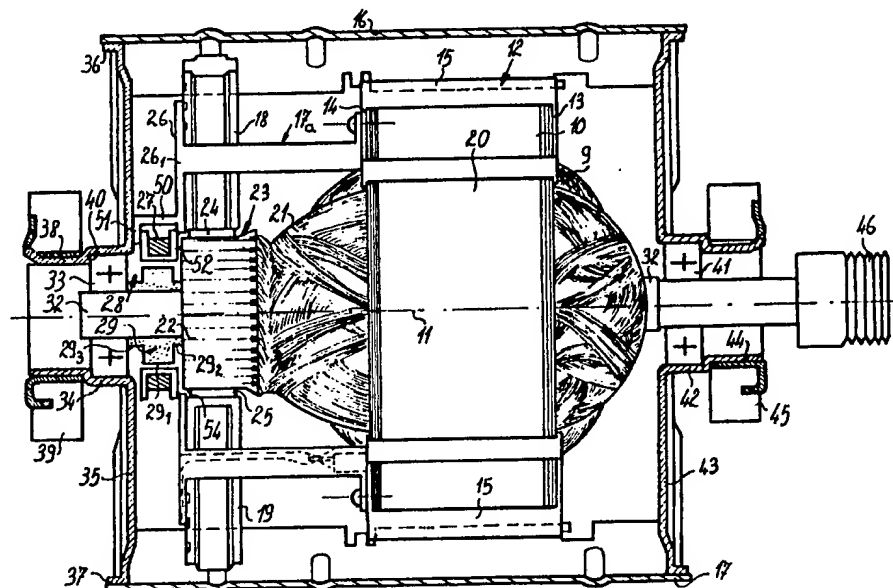
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(54) **Commutator motor combined with a tachometric generator and its manufacturing process**

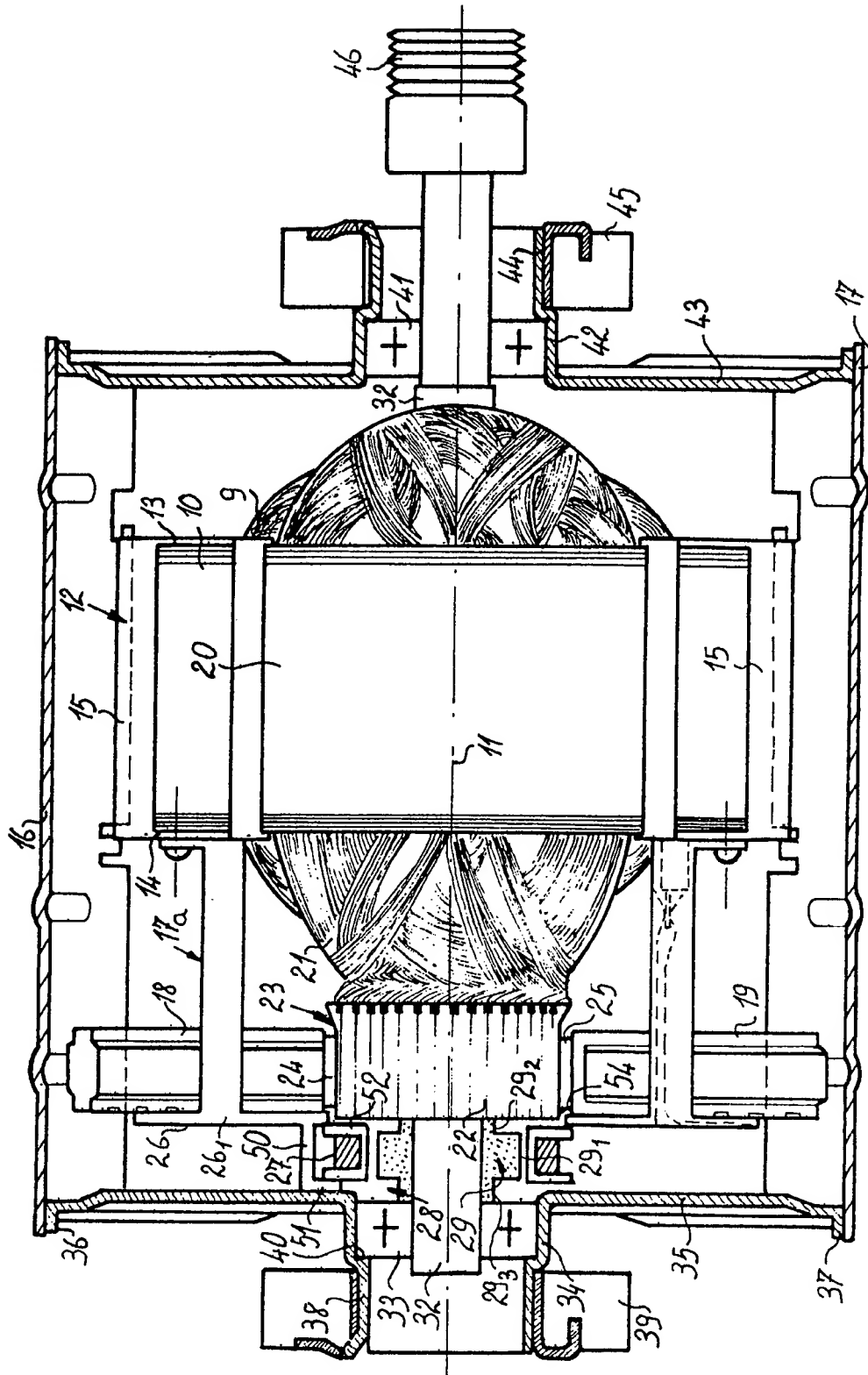
(57) Assembly formed by an electric motor having a commutator (23) the bars (22) of which are in contact with brushes (24, 25), a shaft mounted in a bearing (33) near the commutator (23), and a tachometric generator (28) of which the magnet (29) is mounted on the shaft of the motor.

The tachometric generator (28) is arranged between the commutator (23) and the bearing (33). A side plate (52) of the non-rotating part (27) of the tachometric generator (28) is facing the periphery (54) of the commutator (23) so as to form a screen opposing the propagation towards the bearing (54) of dust caused by the friction of the brushes against the bars of the commutator.



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## SPECIFICATION

**Commutator motor combined with a tachometric generator and its manufacturing process**

The invention relates to a direct current motor, particularly of series type, or to a universal motor, combined with a tachometric generator supplying a signal representing the speed of rotation of the motor in order to regulate that speed.

It is known that a direct current motor includes a stator inductor—most often formed by windings wound on the poles of a magnetic circuit—that generates a continuous magnetic field, as well as rotor coils formed by windings of which the end terminals are connected to diametrically opposed commutator bars and on which rub fixed position brushes for sequentially supplying current to the rotor coils or to sequentially short-circuit these coils. The rotation of the motor is obtained by the action of the magnetic field on each coil through which a current passes or which is short-circuited.

A direct current motor of series excitation type is a motor in which the supply to the inductors is in series with the supply to the rotor coils.

A universal motor has the same structure as a series excitation direct current motor, but it is supplied with alternating current.

It is also known that such motors have a speed of rotation that is strongly dependent on the value of the resistant torque. That is why these motors are often combined with means of regulation enabling the speed to be maintained constant. These means of regulation usually include a tachometric generator having a magnet mounted on the shaft of the motor and surrounded by a coil. The rotation of the magnet in front of the coil induces in that coil a current of which the magnitude is a function of the speed and which is used to control the duration of conduction, during each alternation of a periodic current of a triac in series with the power supply to the motor in order to maintain its speed constant.

It has been noted that with the universal motors or direct current motors known up to the present time the operational noise level is too high for certain applications, particularly domestic applications. In addition, one of the bearings quickly becomes dirty, which can cause premature wear and thus form an additional cause of noise.

The invention contributes to remedying these disadvantages.

It is characterized in that, the tachometric generator being placed between the commutator and a bearing such as a ball bearing with its rotor mounted on the shaft of the motor, a side plate of the non-rotating part of the tachometric generator is facing the periphery

of the commutator so as to form a screen opposing the propagation towards the bearing of dust caused by the friction of the brushes against the bars of the commutator. This screen, of particularly simple constitution, reduces the wear of the bearing and acts against the correlative increase in noise. In addition, the tachometric generator is mounted in the same case as the motor, which avoids having an additional case for that generator.

The noise can be further reduced by mounting the motor-generator assembly as follows: the rotor assembly of the motor which includes the rotor coils, the commutator, the two bearings, the magnet of the tachometric generator between the commutator and a bearing and, possibly, a drive pulley of a load is mounted on the shaft separately from the stator assembly, is then dynamically balanced to avoid any unbalance and, finally, the final assembly of the motor is proceeded with by inserting the rotor assembly in the case.

In the prior art the tachometric generator formed an added part that was not taken into account for the dynamic balancing during the manufacture of the motor. In this way the magnet of the generator could cause unbalances that were generators of noise.

Other characteristics and advantages of the invention will become apparent with the description of some of its embodiments, this being given with reference to the single figure that is an axial cross-section of a motor according to the invention.

The example about to be described with reference to the figures (sic) is a universal motor, i.e. a motor that can be supplied either with direct current or with alternating current and is in current use in domestic applications, particularly for forming the drum drive motor of washing machines.

This motor includes a stator 10 of laminated type, composed of laminations in magnetic or magnetizable material extending perpendicular to the axis 11 of the motor and held stacked by means of a coating 12 in thermo-plastic or polymerizable material having, on the one hand, two end plates 13 and 14 applied against the outer surfaces of the end laminations and, on the other hand, transverse bars 15.

The laminated stator includes two poles (not visible on the drawing) on which are wound the inductor windings 9.

The coating 12 forms a support for elements of the case 16 and 17 which, in the example, are metallic and each has a shape that is part of a cylinder extending only over a fraction of the periphery of the motor. In the axial direction, each of these elements 16 and 17 extend over a longer length than the inductor 10, the part overlapping on the side of the plate 14 being larger than that overlapping on the side of plate 13.

The lateral plate 14 of the coating 12 is integral with a connecting device 17, for guiding and connecting the power supply and/or control conductors. In addition, this device 17, supports the brush-holders 18, 19.

The motor includes, in addition, a rotor 20 wound with windings 21 connected to the bars 22 of a commutator 23 against which are applied the brushes 24, 25.

The device 17 has a transverse end face 26 that has the same position, in the axial direction, as the end of the commutator 23 opposite the windings 21 of the rotor 20.

To the end plate 26, is fixed the coil 27 of a tachometric generator 28 the magnet 29 of which is mounted on the shaft 32 of the motor.

For the fixing of the coil 27, clips 50 protrude in an axial direction from the surface 26 of part 17, each clip ending in a bend 51 forming a hook. Each clip 50 is flexible in the radial direction to allow the installation of the coil 27 which is thus held between the surface 26 on the one hand, and the hooks 51 on the other hand. The case of the coil 27 has a side plate 52 which, in the radial direction, extends all round from the periphery 54 of the commutator 23 to form an effective screen to the dust coming from the friction of the brushes 24, 25 against the bars of the commutator in order that it does not propagate towards a ball bearing 33 mounted on the shaft 32 on the opposite side from the commutator 23 with respect to the magnet 29. The outer ring of this bearing 33 is housed in a cylindrical extension 34 of an end flange 35, metal or plastic, with outer rims 36 and 37 fixed to the ends of case components 16 and 17.

The magnet 29 has a central part 29, of larger diameter which is surrounded by the coil 27 and side parts of smaller diameter, 29<sub>2</sub> pressing against the end surface of the commutator 23 and 29<sub>3</sub> pressing against the inner ring of the bearing 33 respectively. In this way the magnet 29 forms a spacer between on the one hand the commutator 23 and, on the other hand, the bearing 33.

As a variant, instead of the clips 50 protruding from the end surface 26 of part 17, in order to fix the case of the coil 27 to the part 17, projections (not represented) are provided on the plate 52 corresponding with holes (also not represented) in the end plate 26, of part 17.

The extension 34 is itself extended by another cylindrical section 38 of smaller diameter surrounded by a flexible ring 39 for the suspension of the motor. The cylindrical sections 34 and 38 form a shoulder 40 constituting an end stop for the outer ring of the bearing 33.

At the opposite end from the commutator 23 with respect to the rotor 20 on the shaft 32 is mounted the inner ring of another ball

bearing 41 the outer ring of which is housed in the extension 42 of a flange 43 similar to flange 35. The cylindrical nose 42 is extended by another cylindrical section 44 of smaller diameter surrounded by a flexible ring 45 similar to ring 39.

Finally, the end of shaft 32 at the flange 43 end carries a pulley 46 for driving a washing machine drum belt.

The rotating parts and the fixed parts are separately assembled in the manufacture of this motor.

For the rotating part, before its assembly with the rest of the motor, the bearing 33, the magnet 29 of the tachometric generator 28, the commutator 23, the rotor 20 with the windings 21 connected to the bars 22 of the commutator, the ball bearing 41 and the pulley 46 are mounted on the shaft 32.

Before assembly, dynamic balancing of this rotating part is carried out in order to avoid any unbalance.

Thus, after the final assembly, it is no longer necessary to carry out another balancing as no further parts are, after this assembly, fitted on to the shaft 32 whereas in the prior art, the tachometric generator was fitted subsequent to the balancing.

The friction of the brushes 24 and 25 against the bars 22 of the commutator 23 causes dust the propagation of which towards the bearing 33 is prevented by the interposition of the plate 52 of the tachometric generator 28 between the commutator and this bearing 33. In other words, the fixed coil 27 and the rotating magnet 29 form screens to the dust coming from the brushes 24 and 25. In addition the rotation of the magnet 29 gives rise to a deflecting effect pushing the dust radially outwards, this effect adding to the screen effect.

The dynamic balancing of the rotating part of the motor before its assembly with the non-rotating part facilitates manufacturing and, in addition, contributes to reducing the noise generated by the operation of the motor. The interposition of the tachometric generator 28 between the bearing 33 and the brushes 24, 25, increases the lifetime of the bearing 33 and reduces the risk of sound nuisance that can be caused by a dirty or worn bearing.

#### CLAIMS

1. Assembly formed by an electric motor with a commutator (23) of which the bars (22) are in contact with brushes (24, 25) and with a shaft (32) mounted in a bearing (33) near the commutator (23), and by a tachometric generator arranged between the commutator (23) and the bearing (33) and of which the rotor (29) is mounted on the shaft of the motor, characterized in that a side plate (52) of the non-rotating part (27) of the tachometric generator (28) is facing the periphery (54) of the commutator (23) so as to form a screen

opposing the propagation towards the bearing of dust caused by the friction of the brushes against the bars of the commutator.

5 2. Assembly according to Claim 1, characterized in that the tachometric generator (28) includes a magnet (29) mounted on the shaft (32) between the bearing (33) and the commutator (23) which is surrounded by a non-rotating winding (27).

10 3. Assembly according to Claim 1 or 2, characterized in that the non-rotating part (27) of the tachometric generator is integral with a part (17) fixed to a side plate (14) of the stator (12) and which, preferably, carries the brushes (24, 25).

15 4. Assembly according to Claim 3, characterized in that the said part (17) includes an end plate (26,) having axial clips (50) that are flexible in the radial direction to hold the non-rotating part (27) between the end plate (26,) and the lips (51) of these clips.

20 5. Assembly according to Claim 3, characterized in that the said side plate (52) of the non-rotating part (27) of the tachometric generator has projections corresponding with holes in the end plate (26,) of the part (17).

25 6. Assembly according to Claim 2, characterized in that the magnet (29) of the tachometric generator (28) forms a spacer separating the commutator (23) from the bearing (33).

30 7. Assembly according to Claim 6, characterized in that the magnet (29) has a central part (29,) of larger diameter surrounded by the non-rotating winding (27) and lateral parts (29<sub>2</sub> and 29<sub>3</sub>) of smaller diameter.

35 8. Process of assembling an assembly according to any one of Claims 1 to 7, characterized in that, prior to the assembly of the rotating and non-rotating parts, the bearing (33), the rotor (29) of the tachometric generator, the commutator (23), the rotor (20) of the motor and its winding (21), possibly a second bearing (41) as well as a means of driving  
45 (46) a load are mounted on the shaft (32) and dynamic balancing of this assembly mounted on the shaft (32) is carried out in order to prevent any unbalance.

50 9. An electric motor assembly substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.